Long-term outcomes of surgical resection and adjuvant chemotherapy in gastric stromal tumors

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Abstract

Introduction: Gastric stromal tumors are a relatively common group of neoplasms. This study is aimed to evaluate treatment outcomes in patients with gastric stromal tumors who underwent surgery and adjuvant treatment at 108 Military Central Hospital

Patients and Methods: This study included 60 patients with gastric stromal tumors who underwent surgery and adjuvant treatment at 108 Military Central Hospital from January 2021 to December 2023. A cross-sectional descriptive study was conducted to assess clinical and paraclinical characteristics, and to evaluate the outcomes of surgical treatment and postoperative adjuvant therapy.

Results: The male/female ratio was 1.4:1, and the average age was 62±11.1 years. Tumor location was mainly in the body of the stomach in 42 out of 60 cases (70%). Laparoscopic surgery was performed in 41 patients (68.4%). Most procedures were wedge gastrectomy. The mean operative time was 67.2 ± 13.3 minutes in the laparoscopic group, 66.8 ± 17.9 minutes in the laparoscopic-assisted group, and 87.2 ± 14.8 minutes in the open surgery group.

The average postoperative hospital stay was 7.5 ± 4 days. Immunohistochemistry results showed that 100% of patients were positive for CD117, S100, and DOG1.KIT. There were no cases of intraoperative complications. Postoperative complications occurred in 6.6%. Of these, one case of leakage, one case of aspiration pneumonia, and one case of anastomotic stenosis. Sixteen patients received postoperative adjuvant treatment with Imatinib 400mg. There were no postoperative deaths. Local recurrence occurred in one patient 1 year after surgery, and one patient developed lymph node and liver metastasis 1.5 years postoperatively. The median disease-free survival time was 36.53 ± 1.01 months.

Conclusions: Laparoscopic surgery for gastric stromal tumors is a favorable method with short surgery times and faster postoperative recovery. Postoperative adjuvant treatment helps reduce the risk of recurrence in high-risk patients.

Keywords: GIST, gastrointestinal stromal tumor, laparoscopic wedge resection

Introduction

Gastric stromal tumors (GSTs), a subset of gastrointestinal stromal tumors (GISTs), are rare mesenchymal neoplasms originating from the interstitial cells of Cajal (ICCs) in the stomach [1] . ICCs, which serve as pacemaker cells for gastrointestinal motility, give rise to these tumors through oncogenic mutations, primarily in the *KIT* or *PDGFRA* genes [2]. GSTs account for approximately 60–70% of all GISTs, making the stomach the most common site for these tumors [3]. Although GSTs can be asymptomatic and discovered incidentally, they often present with symptoms such as gastrointestinal bleeding, abdominal pain, or obstruction, depending on their size and location [4].

The clinical behavior of GSTs varies widely, ranging from benign to highly malignant, with prognosis largely determined by tumor size, mitotic index, and anatomical location [5]. The risk stratification system, initially proposed by Fletcher [1] and later refined by Joensuu [6], categorizes GISTs into very low, low, intermediate, and high-risk groups based on these parameters. High-risk tumors, characterized by larger size (>5 cm) and higher mitotic rates (>5 mitoses per 50 high-power fields), are associated with higher rates of recurrence and metastasis [7].

Surgical resection remains the cornerstone of treatment for localized GSTs, offering the best chance for cure [8]. Historically, open surgery was the standard approach; however, the advent of minimally invasive techniques has led to a paradigm shift. Laparoscopic surgery, first reported for GISTs in 1992, has gained popularity due to its reduced postoperative pain, shorter hospital stays, and faster recovery times [9] [10]. For small to medium-sized GSTs, laparoscopic wedge resection is often feasible, preserving gastric function while achieving negative margins [11]. Nevertheless, the choice of surgical approach depends on tumor size, location, and the surgeon's expertise [8].

In cases of high-risk GSTs, adjuvant therapy with Imatinib mesylate, a tyrosine kinase inhibitor targeting KIT and PDGFRA, has significantly improved outcomes. The landmark ACOSOG Z9001 trial demonstrated that one year of adjuvant Imatinib reduced recurrence rates in high-risk GIST patients [12]. Subsequent studies, including the SSG XVIII/AIO trial, showed that extending Imatinib therapy to three years further enhances recurrence-free survival [5]. Consequently, current guidelines recommend adjuvant Imatinib for at least three years in high-risk patients [8].

Despite these advancements, challenges remain in the management of GSTs, particularly regarding the optimal duration of adjuvant therapy and the management of recurrent or metastatic disease. Moreover, the role of laparoscopic surgery for larger tumors (>5 cm) remains debated due to concerns about tumor rupture and peritoneal seeding [10]. This study aims to evaluate the treatment outcomes of patients with gastric stromal tumors (GSTs) who underwent surgical resection and, when indicated, adjuvant Imatinib therapy. Specifically, we assess the impact of different surgical approaches (e.g., wedge resection, partial gastrectomy, total gastrectomy) and the role of adjuvant chemotherapy in high-risk patients on both short-term surgical outcomes and long-term oncological results.

Materials and Methods

Study Design and Population

This cross-sectional descriptive study included 60 patients with histologically confirmed GSTs treated between January 2021 and December 2023 and follow-up to April 2024 at 108 Central Military Hospital. Patients required complete records; those with incomplete data or lost to follow-up were excluded.

Patient Inclusion and Exclusion Criteria:

Patients were included if they had a histologically confirmed diagnosis of gastric stromal tumor (GST), underwent surgical resection between January 2021 and December 2023, and had complete medical records. Exclusion criteria included patients with incomplete data, those lost to follow-up, or those with concurrent malignancies.

Surgical Procedure(s):

Surgical resection was performed based on tumor size, location, and the surgeon's judgment. The primary surgical approaches included laparoscopic wedge resection for small to medium-sized tumors (≤5 cm), partial gastrectomy for larger or unfavorably located tumors, and total gastrectomy for extensive or multifocal disease. The choice of procedure aimed to achieve R0 resection while preserving gastric function where possible.

Data Collection

Data collected included demographics (age, sex), clinical presentation, tumor details (size, location, immunohistochemistry), surgical specifics (approach, duration, resection type), postoperative outcomes (hospital stay, complications), adjuvant therapy use, and recurrence. Tumors were diagnosed using immunohistochemistry for CD117 (KIT), DOG1, CD34, SMA, and S100, with risk stratified by size and mitotic index [5].

Postoperative Follow-up Protocol

Patients were followed every 3–6 months during the first two years post-surgery and annually thereafter. Follow-up evaluations included physical examinations, abdominal CT scans, and laboratory tests to monitor for tumor recurrence and assess overall health status.

Adjuvant Chemotherapy:

High-risk patients, defined as those with tumor size >5 cm or mitotic index >5 per 50 HPF, received adjuvant Imatinib at a dosage of 400 mg daily. Treatment was initiated within 4–6 weeks post-surgery and continued for 1–3 years, depending on individual risk stratification and tolerance.

Statistical Analysis

Data were analyzed descriptively, with continuous variables reported as means ± standard deviations (SD) and categorical variables as percentages.

Ethical Considerations

The Institutional Review Board of 108 Central Military Hospital approved the study, ensuring patient confidentiality.

Results

Patient Demographics

The cohort comprised 60 patients (male-to-female ratio 1.4:1; mean age 62 ± 11.1 years).

Tumor Characteristics

Most tumors were in the gastric body (70.0%, 42/60), with 55.0% (33/60) sized 2–5 cm (Table 1).

Table 1. Endoscopic Characteristics of Gastric Stromal Tumors (n = 60)

Characteristic	Subcategory	n	Percentage (%)
Location	Pyloric region	0	0.0
	Antrum	10	16.7
	Body	42	70.0
	Cardia	5	8.3
	Other	3	5.0
Tumor Size	< 2 cm	12	20.0
	2–5 cm	33	55.0
	5–10 cm	4	6.7
	> 10 cm	0	0.0
	Unknown	11	18.3
Mucosal Surface	Ulceration/Bleeding	13	21.7
	Normal	47	78.3

Immunohistochemistry showed 100% positivity for CD117 and DOG1, 98.3% for CD34, 6.7% for SMA, and 0% for S100 .

Surgical Approaches

Laparoscopic surgery was performed in 68.4% (41/60) of cases, laparoscopic-assisted surgery in 13.3% (8/60), and open surgery in 18.3% (11/60). Wedge resection was the predominant surgical technique (73.3%, 44/60) (Table 2). Of the 60 patients, 73.3% underwent wedge resection, 10.0% partial gastrectomy, 3.3% total gastrectomy, 3.3% extended gastrectomy, and 10.0% local excision.

Table 2. Surgical Approaches and Resection Types (n = 60)

Category	Subcategory	n	Percentage (%)
Surgical Method	Laparoscopic	41	68.4
	Laparoscopic-assisted	8	13.3
	Open	11	18.3
Resection Type	Wedge resection	44	73.3
	Distal gastrectomy	6	10.0
	Total gastrectomy	2	3.3
	Extended gastrectomy	2	3.3
	Local excision	6	10.0

Operative Time and Hospital Stay

Mean operative times were 67.2 ± 13.3 minutes (laparoscopic), 66.8 ± 17.9 minutes (laparoscopic-assisted), and 87.2 ± 14.8 minutes (open surgery). The overall mean hospital stay was 7.5 ± 4.0 days, with subgroup means of 9.71 ± 2.34 days (laparoscopic), 9.25 ± 2.34 days (laparoscopic-assisted), and 14.55 ± 8.06 days (open surgery).

Complications

No intraoperative complications were noted. Postoperative complications occurred in 6.7% (4/60) of patients, including leakage (1), pneumonia (1), and anastomotic stenosis (2).

Adjuvant Therapy

Adjuvant Imatinib (400 mg daily) was administered to 26.7% (16/60) of high-risk patients.

Recurrence

Over a median follow-up of 17 months, recurrence occurred in 3.3% of patients: one patient with local recurrence at 12 months and another developed distant metastasis at 18 months. Both recurrences occurred in high-risk patients, highlighting the challenges of managing advanced disease. The median disease-free survival was not reached due to the low number of events, reflecting the generally favorable prognosis associated with appropriate management.

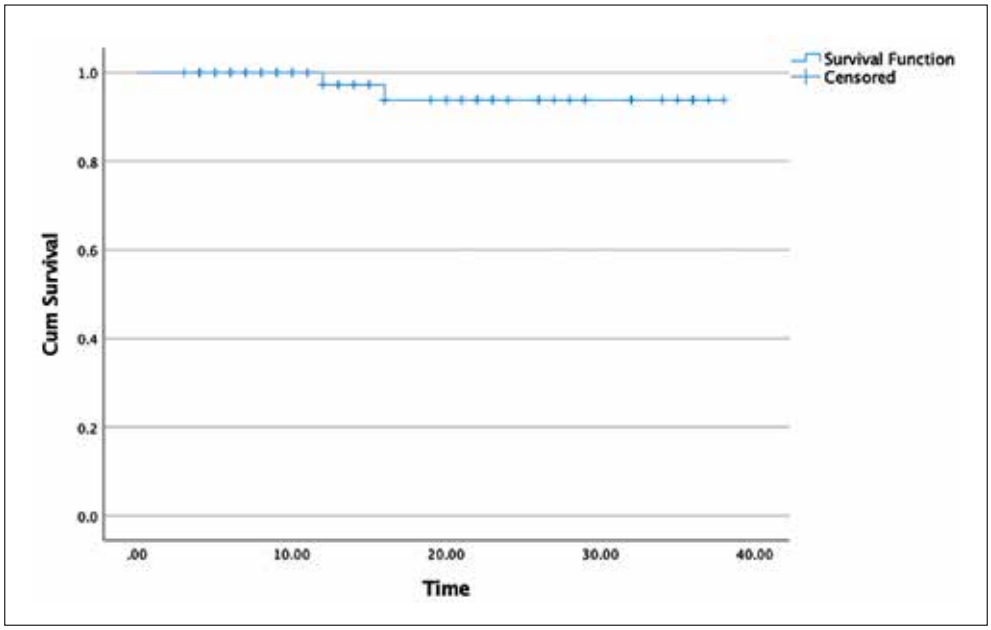

Chart 1. Kaplan-Meier analysis of disease-free survival

Discussion

This study provides valuable insights into the management of gastric stromal tumors (GSTs) at a single military hospital, highlighting the benefits of laparoscopic surgery and adjuvant Imatinib therapy. Our findings are consistent with existing literature while offering unique perspectives from a Vietnamese clinical setting.

Laparoscopic surgery was the predominant approach in our cohort (68.4%), reflecting the global trend toward minimally invasive techniques for GSTs [8][10]. Compared to open surgery, the laparoscopic group showed shorter operative times (67.2 ± 13.3 minutes vs. 87.2 ± 14.8 minutes) and hospital stays (9.71 ± 2.34 days vs. 14.55 ± 8.06 days), consistent with previous reports [11][13]. These advantages are particularly significant in resource-limited settings, where reducing hospital stays can alleviate healthcare burdens. However, our mean hospital stay for laparoscopic cases (9.71 days) is longer than reported in Western studies (typically 3–5 days), possibly due to local postoperative care protocols or patient comorbidities [13]. This discrepancy warrants further investigation to optimize recovery pathways. The absence of intraoperative complications and the low postoperative complication rate (6.7%) underscore the safety of laparoscopic GST resection when performed by experienced surgeons [13]. Notably, the two cases of anastomotic stenosis occurred in patients who underwent gastrectomy, highlighting the technical challenges of these procedures [10]. Nonetheless, our complication rates are comparable to those reported in high-volume centers, suggesting that laparoscopic GST surgery can be safely implemented in military hospitals with appropriate training [12].

Adjuvant Imatinib was administered to 26.7% of our patients, all of whom were classified as high-risk based on tumor size and mitotic index [5]. The low recurrence rate (3.3%) in our cohort is consistent with the efficacy of Imatinib in reducing relapse risk, as demonstrated in the ACOSOG Z9001 and SSG XVIII/AIO trials [12] [5]. However, recurrence occurred in two high-risk patients—one local and one distant—despite adjuvant therapy, highlighting the limitations of current risk stratification models [6]. Recent studies suggest that tumor genotype, particularly KIT exon 11 deletions, may predict Imatinib response and recurrence risk more accurately than traditional criteria [14]. Incorporating molecular profiling into risk assessment could refine patient selection for adjuvant therapy, though this was not feasible in our resource-constrained setting. The median disease-free survival (DFS) was not reached due to the low number of events, reflecting the generally favorable prognosis of GSTs when managed appropriately [8]. However, the three-year follow-up may be insufficient to detect late recurrences, which can occur beyond five years, especially in intermediate-risk tumors [5]. Extended follow-up is essential to fully evaluate the long-term efficacy of our treatment approach.

Our study has several limitations. The cross-sectional design precludes causal inferences, and the small sample size (n = 60) limits statistical power, particularly for subgroup analyses. Additionally, the single-center nature of the study may reduce generalizability, as treatment protocols and patient demographics can vary across institutions. The relatively short follow-up period is another limitation, especially considering that GISTs can recur years after initial treatment [5]. Future research should aim for multicenter collaborations with longer follow-ups to validate our findings.

Despite these limitations, our study contributes valuable data to the limited literature on GST management in Southeast Asia, that may help inform clinical decision-making in comparable low- to middle-resource environments. The high proportion of laparoscopic surgeries and the low recurrence rate demonstrate that optimal outcomes can be achieved in military hospital settings when adequate expertise and resources are available.

Conclusion

Laparoscopic surgery provides significant benefits for GST management, including reduced operative time and recovery duration. Adjuvant Imatinib effectively lowers recurrence risk in high-risk patients. Larger studies with longer follow-ups are needed to refine treatment strategies and enhance long-term outcomes.

References

1. C. D. M. Fletcher et al., "Diagnosis of gastrointestinal stromal tumors: A consensus approach," Hum. Pathol., vol. 33, no. 5, pp. 459–465, May 2002, doi: 10.1053/hupa.2002.123545.
2. S. Hirota et al., "Gain-of-function mutations of c-kit in human gastrointestinal stromal tumors," Science, vol. 279, no. 5350, pp. 577–580, Jan. 1998, doi: 10.1126/science.279.5350.577.
3. M. Miettinen and J. Lasota, "Gastrointestinal stromal tumors: review on morphology, molecular pathology, prognosis, and differential diagnosis," Arch. Pathol. Lab. Med., vol. 130, no. 10, pp. 1466–1478, Oct. 2006, doi: 10.5858/2006-130-1466-GSTROM.
4. B. Nilsson et al., "Gastrointestinal stromal tumors: The incidence, prevalence, clinical course, and prognostication in the preimatinib mesylate era - A population-based study in western Sweden," Cancer, vol. 103, no. 4, pp. 821–829, Feb. 2005, doi: 10.1002/cncr.20862.
5. H. Joensuu et al., "Risk of recurrence of gastrointestinal stromal tumour after surgery: an analysis of pooled population-based cohorts," Lancet Oncol., vol. 13, no. 3, pp. 265–274, Mar. 2012, doi: 10.1016/S1470-2045(11)70299-6.
6. H. Joensuu, "Risk stratification of patients diagnosed with gastrointestinal stromal tumor," Hum. Pathol., vol. 39, no. 10, pp. 1411–1419, Oct. 2008, doi: 10.1016/j.humpath.2008.06.025.
7. R. P. DeMatteo, J. J. Lewis, D. Leung, S. S. Mudan, J. M. Woodruff, and M. F. Brennan, "Two Hundred Gastrointestinal Stromal Tumors," Ann. Surg., vol. 231, no. 1, p. 51, Jan. 2000.
8. P. G. Casali et al., "Gastrointestinal stromal tumours: ESMO-EURACAN Clinical Practice Guidelines for diagnosis, treatment and follow-up," Ann. Oncol. Off. J. Eur. Soc. Med. Oncol., vol. 29, no. Suppl 4, pp. iv68–iv78, Oct. 2018, doi: 10.1093/annonc/mdy095.
9. C. Dholakia and J. Gould, "Minimally invasive resection of gastrointestinal stromal tumors," Surg. Clin. North Am., vol. 88, no. 5, pp. 1009–1018, vi, Oct. 2008, doi: 10.1016/j.suc.2008.05.006.
10. C. S. Inaba et al., "Laparoscopic versus open resection of gastrointestinal stromal tumors: survival outcomes from the NCDB," Surg. Endosc., vol. 33, no. 3, pp. 923–932, Mar. 2019, doi: 10.1007/s00464-018-6393-8.
11. F. Catena et al., "Laparoscopic treatment of gastric GIST: report of 21 cases and literature's review," J. Gastrointest. Surg. Off. J. Soc. Surg. Aliment. Tract, vol. 12, no. 3, pp. 561–568, Mar. 2008, doi: 10.1007/s11605-007-0416-4.
12. R. P. Dematteo et al., "Adjuvant imatinib mesylate after resection of localised, primary gastrointestinal stromal tumour: a randomised, double-blind, placebo-controlled trial," Lancet Lond. Engl., vol. 373, no. 9669, pp. 1097–1104, Mar. 2009, doi: 10.1016/S0140-6736(09)60500-6.
13. M. Matlok, M. Stanek, M. Pedziwiatr, P. Major, J. Kulawik, and P. Budzynski, "Laparoscopic Surgery In The Treatment of Gastrointestinal Stromal Tumors," Scand. J. Surg. SJS Off. Organ Finn. Surg. Soc. Scand. Surg. Soc., vol. 104, no. 3, pp. 185–190, Sep. 2015, doi: 10.1177/1457496914558135.
14. M. C. Heinrich et al., "Correlation of Kinase Genotype and Clinical Outcome in the North American Intergroup Phase III Trial of Imatinib Mesylate for Treatment of Advanced Gastrointestinal Stromal Tumor: CALGB 150105 Study by Cancer and Leukemia Group B and Southwest Oncology Group," J. Clin. Oncol., vol. 26, no. 33, pp. 5360–5367, Nov. 2008, doi: 10.1200/JCO.2008.17.4284.